What we claim is,

1.   A nitride semiconductor wafer having:

a circular shape of a diameter larger than 45mm;

a single-mode distortion which has a maximum or a minimum of a

central height H less than 12μm (12000nm) or of a distortion curvature radius

R longer than 21m;

a top surface of roughness satisfying 0.1nm≤RMS≤5nm; and

a bottom surface of roughness satisfying 0.1nm≤RMS≤5000nm.

2.   The nitride semiconductor wafer according to claim 1, wherein TTV

(total thickness variation) measured at sampling points defined at an interval

0.1mm on the wafer is less than 10μm (10000nm).

3.   The nitride semiconductor wafer according to claim 2, wherein the

distortion curvature radius R (denoted by a m unit) is lager than $D^2/96$, where

D is a diameter of the wafer denoted by a mm unit.

4.   A nitride semiconductor wafer having:

a circular shape of a diameter larger than 45mm;

a single-mode distortion which has a maximum or a minimum of a

central height H less than 5μm or of a distortion curvature radius R longer

than 50m;

a top surface of roughness satisfying 0.1nm≤RMS≤0.5nm; and

a bottom surface of roughness satisfying 0.1nm≤RMS≤2nm.

5.   The nitride semiconductor wafer according to claim 4, wherein TTV

(total thickness variation) measured at sampling points defined at an interval

0.1mm on the wafer is less than 10μm.

6.   A nitride semiconductor wafer having:

a circular shape of a diameter larger than 45mm;

a multi-mode distortion having a plurality of maxima and a plurality of minima in which the largest value Hm of heights of the maxima is less than $12\mu m$ with the minima in contact with a flat plane;

5   a top surface of roughness satisfying $0.1nm \leq RMS \leq 5nm$; and

a bottom surface of roughness satisfying $0.1nm \leq RMS \leq 5000nm$.

7.   The nitride semiconductor wafer according to claim 6, wherein TTV(total thickness variation) measured at sampling points defined at an interval 0.1mm on the wafer is less than $10\mu m$.

10   8.   A nitride semiconductor wafer having:

a circular shape of a diameter larger than 45mm;

a multi-mode distortion having a plurality of maxima and a plurality of minima in which the largest value Hm of heights of the maxima is less than $5\mu m$ with the minima in contact with a flat plane;

15   a top surface of roughness RMS satisfying $0.1nm \leq RMS \leq 0.5nm$; and

a bottom surface of roughness satisfying $0.1nm \leq RMS \leq 2nm$.

9.   The nitride semiconductor wafer according to claim 8, wherein TTV (total thickness variation) measured at sampling points defined at an interval 0.1mm on the wafer is less than $10\mu m$.

20   10.   A method of processing a nitride semiconductor wafer comprising steps of:

a rough shaping step of eliminating fringes of an as-grown wafer and shaping a circumference of the wafer into a circle;

a chamfering step of eliminating edges on the circumference;

25   a first polishing step of gross-polishing a top surface and a bottom

surface of the wafer for removing distortion and reducing roughness; and

a second polishing step of fine-polishing the top surface and the bottom surface by supplying a liquid including an alkali, potassium peroxodisulfate and polishing powder to a polishing machine and irradiating the liquid with ultraviolet rays for raising smoothness of the top surface and the bottom surface.

11.   The method according to claim 10, wherein the first polishing step polishes the wafer in a pressureless state under pressure less than $60g/cm^2$ (= $5880Pa = 44.1Torr = 0.0580atm$) for keeping the wafer in the distorted shape, eliminating protruding portions and edging portions selectively and reducing the distortion.

12.   The method according to claim 11, wherein the first polishing step sandwiches and polishes the wafer between a lower turntable and an upper turntable which face to each other with an air gap wider than an inherent thickness of the wafer but narrower than a height of the distorted wafer in a free state.

13.   The method according to claim 12, wherein the first polishing step pulls up the upper turntable for maintaining the pressureless state and keeping the distortion of the wafers instead of applying a weight.

14.   The method according to claim 13, wherein the first polishing step removes the distortion by laying a plurality of templates with holes and outer gears upon the lower turntable in engagement with a sun gear and an internal gear, putting a plurality of nitride wafers into the holes of the templates on the lower turntable, lowering the upper turntable into contact with protruding parts of the wafers, determining a position of the upper turntable with an air

gap to the lower turntable, applying a lifting up force to the upper turntable for maintaining the pressureless state, supplying a polishing liquid to the air gap between two turntables, revolving the turntables, rotating the internal gear and the sun gear and polishing protrusions or edging portions on both surfaces simultaneously.

15. The method according to claim 14, wherein the first polishing step employs colloidal silica powder, silicon carbide powder, alumina powder or diamond powder of an average diameter from 20μm to 0.5μm as polishing powder.

16. The method according to claim 11, wherein the second polishing step employs a polishing liquid including potassium hydroxide from 0.5M to 4M, potassium peroxodisulfate from 0.2M to 2M and polishing powder.

17. The method according to claim 16, wherein the polishing powder in the second polishing step is colloidal silica granules having a diameter from 50 nm to 450 nm.

18. The method according to claim 17, wherein the colloidal silica granules have an average diameter of 0.2μm (200nmφ).

19. The method according to claim 18, wherein the potassium peroxodisulfate is excited by a mercury lamp emitting ultraviolet rays of a wavelength of 254nm.

20. The method according to claim 19, wherein the second polishing step improves top surface roughness RMS down to $0.1nm \leq RMS \leq 5nm$ and bottom surface roughness RMS down to $0.1nm \leq RMS \leq 5000nm$.